

**AMENDMENTS TO THE CLAIMS:**

*Please amend claims 1 and 72-74 as follows, and cancel claims 2-71, and add new claims 75-144.*

1. *(Currently Amended)* ~~A Method~~ method of manufacturing a metal oxide, metal oxidhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, comprising ~~the steps of:~~

- introducing a solid reactor filling material ~~in~~ into a reactor,
- introducing a metal-containing precursor ~~in~~ into said reactor,
- introducing a co-solvent into ~~the~~ said reactor,
- introducing a supercritical solvent into ~~the~~ said reactor, thereby
- establishing a contact between the metal-containing precursor and the co-solvent, thus
- resulting in the formation of said product in the proximity of ~~the~~ said solid reactor filling material.

*Claims 2-71 (Canceled)*

72. *(Currently Amended)* ~~An Apparatus~~ apparatus for manufacturing a metal oxide, metal oxidhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, said apparatus comprising ~~the following components:~~

- a solid reactor filling material in a reactor,
- means for introducing a metal-containing precursor ~~in~~ into said reactor,
- means for introducing a co-solvent into ~~the~~ said reactor,

- means for introducing a supercritical solvent into ~~the~~ said reactor,
- said reactor intended as a space for establishing a contact between the metal-containing precursor and the co-solvent and
- said reactor intended as a space for the formation of said product in the proximity of ~~the~~ said solid reactor filling material.

73. *(Currently Amended)* An apparatus according to claim 72 further comprising means for introducing the solid reactor filling material into the reactor.

74. *(Currently Amended)* An apparatus according to claim 72 ~~or 73~~ further comprising means for extracting the solid reactor filling material from the reactor.

75. *(New)* A method according to claim 1, wherein the formation of said product takes place by a process involving at least a sol-gel reaction.

76. *(New)* A method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is substantially crystalline.

77. *(New)* A method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is substantially amorphous.

78. *(New)* A method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is a mixture of several different phases.

79. *(New)* A method according to claim 1, wherein the introduction of the solid reactor filling material, the metal-containing precursor, the co-solvent, and the supercritical solvent into the said reactor is done in arbitrary order.

80. *(New)* A method according to claim 1, wherein at least one of the solid reactor filling material, the metal-containing precursor, the co-solvent or the supercritical solvent is mixed with at least one of the solid reactor filling material, the metal-containing

precursor, the co-solvent or the supercritical solvent before introduction into said reactor.

81. *(New)* A method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is manufactured in a mode selected from the group consisting of: a batch mode, a quasi-batch mode and a substantially continuous mode.

82. *(New)* A method according to claim 1, wherein a temperature in the reactor during the formation of said product is kept at a fixed temperature.

83. *(New)* A method according to claim 1, wherein a temperature in the reactor during the formation of said product is performed at an increasing temperature.

84. *(New)* A method according to claim 1, wherein a temperature in the reactor during the formation of said product is performed at a decreasing temperature.

85. *(New)* A method according to claim 1, wherein a temperature in the reactor during the formation of said product is performed at a temperature profile including an arbitrary combination of at least two of the following temperature profiles: a fixed temperature, an increasing temperature, a decreasing temperature.

86. *(New)* A method according to claim 82, wherein the temperature in the reactor during the formation of said product is maximum 400°C, maximum 300°C, maximum 200°C, maximum 100°C, or maximum 50°C.

87. *(New)* A method according to claim 1, wherein a pressure in the reactor during the formation of said product is kept at a fixed pressure.

88. *(New)* A method according to claim 1, wherein a pressure in the reactor during the formation of said product is performed at an increasing pressure.

89. *(New)* A method according to claim 1, wherein a pressure in the reactor during the formation of said product is performed at a decreasing pressure.
90. *(New)* A method according to claim 1, wherein a pressure in the reactor during the formation of said product is performed at a pressure profile including an arbitrary combination of at least two of the following pressure profiles: a fixed pressure, an increasing pressure, and a decreasing pressure.
91. *(New)* A method according to claim 1, wherein the supercritical solvent is CO<sub>2</sub>, and the pressure in the reactor during the formation of said product is minimum 74 bar, more minimum 80 bar, minimum 90 bar, or minimum 100 bar.
92. *(New)* A method according to claim 1, wherein the supercritical solvent is CO<sub>2</sub>, and the temperature in the reactor during the formation of said product is minimum 31°C, minimum 43°C, minimum 100°C, minimum 200°C, minimum 300°C, or minimum 400°C.
93. *(New)* A method according to claim 1, wherein the supercritical solvent is isopropanol, and the pressure in the reactor during the formation of said product is minimum 47 bar, minimum 80 bar, minimum 90 bar, or minimum 100 bar.
94. *(New)* A method according to claim 1, wherein the supercritical solvent is isopropanol, and the temperature in the reactor during the formation of said product is minimum 235°C, minimum 250°C, minimum 270°C, minimum 300°C, or alternatively minimum 400°C.
95. *(New)* A method according to claim 1, wherein the supercritical solvent is in supercritical phase before the introduction into said reactor.
96. *(New)* A method according to claim 1, wherein the supercritical solvent is brought into a supercritical phase after the introduction into said reactor.

97. *(New)* A method according to claim 1, wherein the time of the formation of said product is maximum 1 hour, maximum 0.75 hour, or maximum 0.5 hour.
98. *(New)* A method according to claim 1, wherein the time of the formation of said product is maximum 8 hours, maximum 6 hours, or maximum 2 hours.
99. *(New)* A method according to claim 1, wherein the time of the formation of said product is maximum 24 hours, maximum 17 hours, or maximum 10 hours.
100. *(New)* A method according to claim 1, further comprising introducing a plurality of different metal-containing precursors into said reactor.
101. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor which is a metal alkoxide.
102. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor selected from the group consisting of : titanium tetraisopropoxide, titanium butoxide, titanium ethoxide, and titanium methoxide.
103. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor which is selected from the group consisting of: aluminium isopropoxide and aluminium-sec-butoxide.
104. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor which is magnesium ethoxide.
105. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor which is a metal salt.
106. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor which is  $\text{Ti}(\text{SO}_4)_2$ .

107. *(New)* A method according to claim 1, further comprising introducing into said reactor a metal-containing precursor selected from the group consisting of:  $\text{TiCl}_4$  and  $\text{AlCl}_3$ .
108. *(New)* A method according to claim 1, wherein the co-solvent is selected from the group consisting of: water, ethanol, methanol, hydrogenperoxide and isopropanol.
109. *(New)* A method according to claim 1, wherein a plurality of different co-solvents is introduced into said reactor.
110. *(New)* A method according to claim 1, wherein the solid reactor filling material functions as a heterogeneous catalyst.
111. *(New)* A method according to claim 108, wherein the solid reactor filling material comprises at least one promoter.
112. *(New)* A method according to claim 1, wherein the solid reactor filling material includes at least one fibre.
113. *(New)* A method according to claim 1, wherein the solid reactor filling material includes a powder.
114. *(New)* A method according to claim 1, wherein the solid reactor filling material has the shape selected from the group consisting of: a sponge, a grid, a wad of fibres, and a sheet.
115. *(New)* A method according to claim 1, wherein the solid reactor filling material has a substantially porous structure.
116. *(New)* A method according to claim 1, wherein the solid reactor filling material has a size and shape capable of substantially confining the metal-containing precursor to a limited part of the reactor.

117. (*New*) A method according to claim 1, wherein the solid reactor filling material comprises a polymer.

118. (*New*) A method according to claim 117, wherein the polymer comprises: polystyrene (PS), polypropylene (PP), polyethylene (PE), polyvinyl chloride (PVC), polyvinylidene chloride (PVDC), or polyvinyl acetate (PVAc).

119. (*New*) A method according to claim 117, wherein the polymer is selected from the group of: acrylic polymer, fluorinated polymer, diene polymer, vinyl copolymer, polyamide polymer, polyester polymer, polyether polymer, and polyimide polymer.

120. (*New*) A method according to claim 1, wherein the solid reactor filling material comprises a metal.

121. (*New*) A method according to claim 120, wherein the metal comprises: titanium, aluminium, zinc, vanadium, magnesium, zirconium, chromium, molybdenum, niobium, tungsten, copper, or iron.

122. (*New*) A method according to claim 1, wherein the solid reactor filling material comprises a metal oxide.

123. (*New*) A method according to claim 122, wherein the metal oxide comprises: titanium oxide, zinc oxide, copper oxide, aluminium oxide, vanadium oxide, magnesium oxide, zirconium oxide, chromium oxide, silicium oxide, molybdenum oxide, niobium oxide, tungsten oxide, or iron oxide.

124. (*New*) A method according to claim 1, wherein the solid reactor filling material comprises a ceramic.

125. (*New*) A method according to claim 1, wherein the solid reactor filling material comprises a metal sulphate.

126. *(New)* A method according to claim 1, wherein the solid reactor filling material comprises a metal halide.

127. *(New)* A method according to claim 1, wherein the solid reactor filling material comprises a metal oxide, a metal oxidhydroxide or a metal hydroxide identical to said product resulting from the formation in said reactor.

128. *(New)* A method according to claim 1, wherein the solid reactor filling material functions as seed material for the formation of said product.

129. *(New)* A method according to claim 1, wherein the solid reactor filling material functions as a collecting agent for said product.

130. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material with no further treatments of the solid reactor filling material.

131. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material without substantially degrading the solid reactor filling material.

132. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material in a way that allows the solid reactor filling material to be re-used as solid reactor filling material.

133. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material by flushing the solid reactor filling material in a fluid.

134. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material by vacuum means.

135. *(New)* A method according to claim 1, wherein said product is separable from the solid reactor filling material by blowing means.



136. (*New*) A method according to claim 1, wherein said product is separable from the solid reactor filling material by ultrasonic means.

137. (*New*) A metal oxide, metal oxidhydroxide or metal hydroxide product manufactured by the method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is in the form of aggregates of primary particles with an average primary particle size of maximum 1000 nm, maximum 500 nm, or maximum 100 nm.

138. (*New*) A metal oxide product manufactured by the method according to claim 1, wherein the metal oxide, the metal oxidhydroxide or the metal hydroxide product is in the form of aggregates of primary particles with an average primary particle size of 100 nm, maximum 50 nm, maximum 20 nm, or maximum 10 nm.

139. (*New*) A metal oxide product manufactured by the method according to claim 1, wherein the metal oxide product is  $\text{TiO}_2$ , with a crystallinity of minimum 20%, minimum 30%, minimum 40%, minimum 60%, or minimum 80%.

140. (*New*) A metal oxide product manufactured by the method according to claim 1, wherein the metal oxide product is  $\text{TiO}_2$  of anatase structure.

141. (*New*) A metal oxide product manufactured by the method according to claim 1, wherein the metal oxide is selected from the group consisting of:  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{WO}_3$ ,  $\text{Nb}_2\text{O}_5$ ,  $\text{TaO}_3$ ,  $\text{CuO}$ ,  $\text{CoO}$ ,  $\text{NiO}$ ,  $\text{SiO}_2$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{ZnO}$ .

142. (*New*) A metal oxidhydroxide product manufactured by the method according to claim 1, wherein the metal oxidhydroxide is selected from the group consisting of: iron oxidhydroxide, titanium oxidehydroxide, manganese oxidhydroxide and aluminium oxidhydroxide.

143. (*New*) A metal oxidhydroxide product manufactured by the method according to claim 1, wherein the metal oxidhydroxide is aluminium oxidhydroxide of Boehmite structure.

144. (*New*) A metal hydroxide product manufactured by the method according to claim 1, wherein the metal hydroxide is selected from the group consisting of: iron hydroxide, silicium hydroxide, zirconium hydroxide, titanium hydroxide, manganese hydroxide and aluminium hydroxide.